



Docket No.: 042390.P7045D

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Ramalingam, et al.

Application No.: 09/874,666

Filed: June 5, 2001

For: A Controlled Collapse Chip  
Connection (C4) Integrated Circuit  
Package Which Has Two Dissimilar  
Underfill Materials

Examiner: David E. Graybill

Art Group: 2827

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PRELIMINARY AMENDMENT

BOX RCE  
Assistant Commissioner for Patents  
Washington, DC 20231-9998

Sir:

Please amend the above-identified Application as follows:

IN THE CLAIMS

Following is a complete set of claims as amended with this Response. This complete set of claims excludes claims 7-14 and 26-30, cancelled without prejudice, and requests examination of new claims 31-48.

- 1 31. (New) An integrated circuit package comprising:
- 2 a substrate;
- 3 an integrated circuit attached to the substrate;
- 4 a first material dispensed at a first temperature between the substrate and the integrated
- 5 circuit as underfill; and

6 a second material dispensed at a second temperature less than the first temperature  
7 around edges of the integrated circuit and the first material to act as a circumferential fillet, the  
8 second material having a lower adhesion property than the first material.

1 32. (New) The integrated circuit of claim 31, wherein the second material is an  
2 anhydride epoxy.

1 33. (New) The integrated circuit of claim 31, wherein the substrate is baked at a  
2 temperature greater than a temperature at which the first and second materials are applied.

1 34. (New) The integrated circuit of claim 31, wherein the second material seals the  
2 first material.

1 35. (New) The integrated circuit of claim 31, wherein the second temperature is  
2 within a range of 80 degrees Celsius to 120 degrees Celsius.

1 36. (New) The integrated circuit of claim 31, wherein the second material being  
2 dispensed only after the first material is dispensed and the integrated circuit is heated to a third  
3 temperature being greater than the first temperature.

1 37. (New) An integrated circuit package comprising:  
2 a substrate having a first surface and a second surface;  
3 an integrated circuit coupled to the first surface of the substrate;  
4 a first material coupled to the integrated circuit and the first surface of the substrate, the  
5 first material operating as underfill between the integrated circuit and the first surface of the  
6 substrate; and

7 a second material attached to the integrated circuit and the first surface of the substrate,  
8 the second material forming a circumferential fillet surrounding both edges of the integrated  
9 circuit and the first material.

1 38. (New) The integrated circuit package of claim 37, wherein the substrate to  
2 electrically connect solder balls on the first surface to solder balls on the second surface.

1 39. (New) The integrated circuit package of claim 37, wherein the first material is  
2 dispensed at a temperature within a first temperature range.

1 40. (New) The integrated circuit package of claim 39, wherein the first material  
2 being positioned for coupling to the integrated circuit and the first surface of the substrate under  
3 a wicking action.

1 41. (New) The integrated circuit package of claim 39, wherein the second material is  
2 dispensed at a temperature within a second temperature range having an average temperature less  
3 than an average temperature associated with the first temperature range.

1 42. (New) The integrated circuit package of claim 41, wherein the average  
2 temperature of the second temperature range is at least ten degrees Celsius less than the average  
3 temperature of the first temperature range.

1 43. (New) A printed circuit board comprising:  
2 a plurality of solder balls; and  
3 an integrated circuit package coupled to the plurality of solder balls, the integrated circuit  
4 package comprises

5 a substrate including a first surface and a second surface,  
6 an integrated circuit coupled to the first surface of the substrate,  
7 a first material coupled to the integrated circuit and the first surface of the  
8 substrate, the first material operating as underfill between the integrated circuit and the  
9 first surface of the substrate, and  
10 a second material attached to the integrated circuit and the first surface of the  
11 substrate, the second material forming a circumferential fillet surrounding both edges of  
12 the integrated circuit and the first material.

1 44. (New) The printed circuit board of claim 43, wherein the substrate to electrically  
2 connect solder balls on the first surface to solder balls on the second surface.

1 45. (New) The printed circuit board of claim 43, wherein first material is dispensed  
2 at a temperature within a first temperature range.

1 46. (New) The printed circuit board of claim 43, wherein the first material being  
2 positioned for coupling to the integrated circuit and the first surface of the substrate under a  
3 wicking action.

1 47. (New) The printed circuit board of claim 43, wherein the second material is  
2 dispensed at a temperature within a second temperature range having an average temperature less  
3 than an average temperature associated with the first temperature range.

1 48. (New) The printed circuit board of claim 47, wherein the average temperature of  
2 the second temperature range is at least ten degrees Celsius less than the average temperature of  
3 the first temperature range.

### REMARKS

This preliminary amendment is filed with a Request for Continue Examination (RCE). Although Applicant respectfully traverses the rejections set forth in the prior Office Action, the claims have been cancelled without prejudice and additional claims (31-48) have been added to cover inventive aspects of the invention. Examination of pending claims 31-48 is respectfully requested.